Physics	2019	
Time: 15 Minutes	Group-I (Objective Type)	Paper-I Marks: 12

Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1- Newton's first law of motion is valid only in the absence of:

(a) Force
(b) Net force √
(c) Friction
(d) Momentum

2- The range of clinical thermometer is:

(a) 20°C – 42°C
(b) 25°C – 42°C
(c) 30°C – 42°C
(d) 35°C – 42°C √

3- Speed of light is:

(a) $2 \times 10^8\ ms^{-1}$
(b) $2 \times 10^9\ ms^{-1}$
(c) $3 \times 10^8\ kms^{-1}$
(d) $3 \times 10^8\ ms^{-1}$ √

4- Cheetah can run at a speed of:

(a) $50\ km\ h^{-1}$
(b) $60\ km\ h^{-1}$
(c) $70\ km\ h^{-1}$ √
(d) $80\ km\ h^{-1}$

5- The work done in lifting a brick of mass 2 kg through a height of 5 m above ground will be:

(a) 2.5 J
(b) 10 J
(c) 50 J
(d) 100 J √

6- In gases, heat is mainly transferred by:

(a) Molecular collision
(b) Conduction
(c) Convection √
(d) Radiation

7- **S.I unit of momentum is:**

(a) $Kgm^{-1}s^{-1}$ (b) $Kg^{-1}m^{-1}s$

(c) Kgms (d) $Kgms^{-1}$ √

8- **The number of perpendicular components of force are:**

(a) 1 (b) 2 √

(c) 3 (d) 4

9- **Moon is _____ km away from the earth.**

(a) 1,80,000 km (b) 2,80,000 km

(c) 3,80,000 km √ (d) 4,80,000 km

10- **Generally faces of Leslie's cube are:**

(a) 3 (b) 4 √

(c) 5 (d) 6

1- **The least count of digital vernier callipers is:**

(a) 0.1 mm √ (b) 0.01 mm

(c) 0.001 mm (d) 0.0001 mm

2- **S.I unit of pressure is Pascal which is equal to:**

(a) $10^4\ Nm^{-2}$ (b) $1\ Nm^{-2}$ √

(c) $10^2\ Nm^{-2}$ (d) $10^3\ Nm^{-2}$

Physics	ass 2019	
Time: 1.45 Hours	Group-I (Subjective Type)	Paper-I
	(Part-I)	Marks: 48

2. Write short answers to any FIVE (5) questions: 10

(i) What is meant by base quantities and base units?

Ans **Base quantities:**

Base quantities are the quantities on the basis of which other quantities are expressed.

Base unit:

The units that describe base quantities are called base units. Each base quantity has its SI unit.

(ii) Define scientific notation.

Ans The numbers written as power or prefix of ten in which there is only one non-zero number before the deciminal.

(iii) Write four name of laboratory safety equipments.

Ans **Laboratory Safety Equipments:**

A school laboratory must have safety equipments such as:

1. Eye-protection glasses
2. Fire extinguisher.
3. Fire alarm.
4. First Aid Box.

(iv) Define terminal velocity.

Ans The constant speed that a freely falling object eventually reaches, when the resistance of the medium through which it is falling, prevents further acceleration is

called terminal velocity. (A paratrooper attains a uniform velocity called terminal velocity with which it comes to ground.

(v) Differentiate between vectors and scalars.

Ans A vector can be described completely by magnitude unit along with its direction. While, A physical quantity which can be completely described by its magnitude and unit is called a scalar.

(vi) What is meant by braking and skidding?

Ans **Braking:**

To stop a car, bike or any other vehicle quickly; large force of friction between the tyres and the road is needed. To stop the vehicle with this force is called braking.

Skidding:

If the brakes are applied to strongly, the wheels of the vehicle will lock up (stop turning) and the vehicle will skid due to its large momentum. The motion of wheel without revolving is called skidding.

(vii) Write two methods of reducing friction.

Ans Following are two ways to reduce friction:

1. By using oil, we can reduce friction.
2. By using ball bearing in machines, we can reduce friction.

(viii) Define centripetal force and write its formula.

Ans Centripetal force is a force that keeps a body to move in a circle.

$$F_c = \frac{mv^2}{r}$$

3. **Write short answers to any FIVE (5) questions: 10**

(i) **What is meant by unstable equilibrium?**

Ans If a body does not return to its previous position when sets free after a slightest tilt, it is said to be in unstable equilibrium.

(ii) **What is difference between like and unlike parallel forces?**

Ans Like parallel forces are the forces that are parallel to each other and have the same direction.

Unlike parallel forces are the forces that are parallel but have directions opposite to each other.

(iii) **How the mass of earth can be determined?**

Ans Let the mass of Earth be denoted by 'M_e'. If a body of mass m is placed on surface of Earth, the force of attraction on the body due to Earth is given by:

$$F = G\frac{m\,Me}{R^2}$$

Here $F = mg$

$$mg = G\frac{m\,Me}{R^2}$$

$$\boxed{Me = \frac{gR^2}{G}}$$

(iv) **Define field force.**

Ans The velocity of a body, thrown up, goes on decreasing while, in return, its velocity goes on increasing. This is due to gravitational pull of the Earth acting on the body whether the body is in contact with Earth or not. Such a force is called the field force.

(v) Write the value of 'G' and write its S.I unit.

Ans The value of G is 6.673×10^{-11} and its S.I unit is $Nm^2 Kg^{-2}$.

(vi) What do you mean by light energy?

Ans Light is an important form of energy. Plants produce food in the presence of light. We also need light to see things. We get light from candles, electric bulbs, fluorescent tubes and also by burning fuel. However, most of the light comes from the Sun.

(vii) Define potential energy and write its equation.

Ans The energy possessed by a body due to its position is known as its potential energy.

The equation of potential energy is:

$$P.E = mgh$$

(viii) Define power and write its S.I unit.

Ans Power is defined as the rate of doing work.

The S.I unit of power is watt (W).

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4. Write short answers to any FIVE (5) questions: 10

(i) State Hooke's Law.

Ans Hooke's law states that:

"The strain produced in a body by the stress applied to it is directly proportional to the stress within the elastic limit of the body."

Thus Stress $\propto$ Strain

or Stress = Constant $\times$ Strain

or $\frac{\text{Stress}}{\text{Strain}}$ = Constant

(ii) State Young's Modulus.

Ans The rate of stress to tensile strain is called Young's modulus. Mathematically,

$$\text{Young's Modulus } Y = \frac{\text{Stress}}{\text{Strain}}$$

(iii) Define density and elasticity.

Ans **Density:**

Density is defined as mass per unit volume.

Elasticity:

The property of the body to restore to its original size and shape as deforming force ceases to act is called elasticity.

(iv) Define latent heat of fusion.

Ans Heat energy required to change unit mass of a substance from solid to liquid state at its melting point without change in its temperature is called its latent heat of fusion.

(v) Differentiate between heat and temperature.

Ans Temperature of a body is the degree of hotness or coldness of the body.

Heat is the energy that is transferred from one body to the other in thermal contact with each other as a result of the difference of temperature between them.

(vi) Define thermal conductivity of a substance.

Ans The amount of heat that flows in unit time is called the rate of flow of heat or thermal conductivity.

(vii) What is difference between land and sea breezes?

Ans Land and sea breezes are the result of convection. The air above land gets hot and rises up. Cold air from the sea begins to move towards the land. It is called sea breeze.

At night, the land cools faster than the sea. Therefore, air above the sea is warmer, rises up and the cold air from the land begins to move towards the sea. It is called land breeze.

(viii) Write two uses of good conductors.

Ans Following are the two uses of good conductors:

1. Aluminium is good conductor of electricity

2. Mercury is an excellent liquid conductor that finds use in many instruments.

(Part-II)

Note: Attempt any TWO (2) questions.

Q.5.(a) Derive first equation of motion with the help of speed-time graph. (4)

Ans For Answer see Paper 2016 (Group-II), Q.5.(a).

(b) How much centripetal force is needed to make a body of mass 0.5 kg to move in a circle of radius 50 cm with a speed 3 ms^{-1}? (5)

Ans For Answer see Paper 2018 (Group-I), Q.5.(b).

Q.6.(a) State and explain the conditions for equilibrium. (4)

Ans There are two conditions for a body to be in equilibrium:

First Condition for Equilibrium:

A body is said to satisfy first condition for equilibrium if the resultant of all the forces acting on it is zero. Let a number of forces $F_1, F_2, F_3, \ldots, F_n$ are acting on a body such that

$$F_1 + F_2 + F_3 + \ldots + F_n = 0$$

or

$$\Sigma F = 0 \quad \text{(i)}$$

The symbol Σ is a Greek letter called sigma used for summation. Equation (i) is called the first condition for equilibrium.

The first condition for equilibrium can also be stated in terms of x and y-components of the forces acting on the body as:

$$F_{1x} + F_{2x} + F_{3x} + \ldots + F_{nx} = 0$$

and $$F_{1y} + F_{2y} + F_{3y} + \ldots + F_{ny} = 0$$

or

$$\Sigma F_x = 0 \quad \text{(ii)}$$

and $\Sigma F_y = 0$ (iii)

A book lying on a table or a picture hanging on a wall, are at rest and thus satisfy first condition for equilibrium. A paratrooper coming down with terminal velocity (constant velocity) also satisfies first condition for equilibrium and is thus in equilibrium.

Second Condition for Equilibrium:

First condition for equilibrium does not ensure that a body is in equilibrium.

Consider a body pulled by the forces F_1 and F_2. The two forces are equal but opposite to each other. Both are acting along the same line, hence their resultant will be zero. According to the first condition, the body will be in equilibrium. Now shift the location of the forces. In this situation, the body is not in equilibrium although the first condition for equilibrium is still satisfied. It is because the body has the tendency to rotate. This situation demands another condition for equilibrium in addition to the first condition for equilibrium. This is called second condition for equilibrium. According to this, a body satisfies second condition for equilibrium when the resultant torque acting on it is zero. Mathematically,

$$\Sigma \tau = 0$$

(b) A motor boat moves at a steady speed of 4 ms^{-1}. Water resistance acting on it is 4000 N. Calculate power of its engine. (5)

Ans Speed of motor boat = V = 4 ms^{-1}

Water resistance acting on board = 4000 N

Power = P = ?

As we know

$$P = \frac{W}{t}$$

$$P = \frac{F\,S}{t}$$

$$P = F\left(\frac{S}{t}\right)$$

$$P = FV$$

$$P = 4000 \times 4$$

$$P = 16000 \text{ W}$$

$$\boxed{P = 16 \text{ kW}}$$

Q.7.(a) Define volume thermal expansion. Derive equation $V = V_o (1 + \beta \Delta T)$.

Ans The volume of a solid also changes with the change in temperature and is called volume thermal expansion or cubical thermal expansion. Consider a solid of initial volume V_o at certain temperature T_o. On heating the solid to a temperature T, let its volume become V, then

Change in the volume of a solid $\Delta V = V - V_o$

and Change in temperature $\Delta T = T - T_o$

Like linear expansion, the change in volume ΔV is found to be proportional to its original volume V_o and change in temperature ΔT. Thus

$$\Delta V \propto V_o \Delta T$$

or $$\Delta V = \beta V_o \Delta T$$

$$V - V_o = \beta V_o \Delta T$$

$$V = V_o + \beta V_o \Delta T$$

$$\therefore \quad V = V_o(1 + \beta \Delta T)$$

where β is the temperature coefficient of volume expansion.

(b) An object has weight 18 N in air. Its weight is found to be 11.4 N when immersed in water. Calculate its density. Can you guess the material of the object?

Ans Weight of object in air = $w_1 = 18$ N

// // // in water = $w_2 = 11.4$ N

Density of water = $\rho w = 1000\ kgm^{-3}$

Gravitational acceleration = $g = 10\ ms^{-2}$

$$w = w_1 - w_2$$
$$= 18 - 11.4$$
$$= 6.6\ N$$

Density of material = ?

Name of material = ?

$$\frac{D}{p} = \frac{w_1}{w}$$

$$\frac{D}{1000} = \frac{18}{6.6}$$

$$D = \frac{18000}{6.6}$$

$$D = 2727.27\ kg\ m^{-3}$$

As this density is approximately equal to density of aluminium. So, material name is aluminium.